AIDU艾都

艾都勘探 铸造典范

ACZ-8智能型质子磁力仪

ACZ-8 Intelligent Proton Magnetometer

产品使用手册

Instruction manual

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一、仪器原理概述

质子磁力仪属于众多磁力仪中的一个精度较高的分支，它即使对较弱磁性物的测量，如地球的磁场，仍能取得较高的分辨率和精度，所以即使对地球磁场的微弱的变化，也能够测知。它的工作原理是利用氢质子在磁场中的旋进现象进行测量的。在传感器中，充满了含氢的液体，这些氢质子在被仪器强制极化之前，处于无规律的排列状态。当人为对其加上一个极化信号后，质子将做旋进运动。极化信号消失后，质子的旋进将主要受到外界磁场的影响会逐渐消失，通过对受旋进影响的传号器中频率的测量，来测知外界磁场的大小。不断对这个动作进行循环，即可持续测量。

ACZ-8质子磁力仪磁场测量精度为±1nT，分辨率高达0.1nT，完全符合原地矿部发布的《地面高精度磁测工作规程》要求。

二、仪器主要特点

》 大存储容量、高分辨和灵活性可用于野外作业，也可用做基站测量。
》 即可全量程自动调谐，也可人工手动调谐。
》 内置精密时钟、GPS授时确保基站和各移动测站的时钟精确同步。
》 每个测量点均保存有磁场测量结果、测点坐标、时间等信息，
》 U盘数据直接导出所有数据。
》 配备软件进行日变修正、可绘制等值线图、剖面图等。
》 全中文界面，自动显示磁场强度曲线，让操作更简单、更方便，一人可完成 全部测量任务。

三、应用范围

》 矿产勘查，如铁矿、铅锌矿、铜矿等
》 配合矿区勘探，研究矿体的埋深、产状和连续性，研究矿体的形状、大小，估计矿床规模
》 石油、天然气勘查，研究与油气有关的地质构造及大地构造等问题
》 普查、详查、地质填图
》 航空及海洋磁测的地面日变站
》 断层定位
》 考古
》 水文
》 工程勘查，如管线探测等
》 地震前兆监测，火山观测以及其它环境及灾害地质工作

》 小型铁磁物体的探测等

四、仪器主要技术参数

1.测量范围：20，000 nT～100,000 nT
2.测量精度：± 1nT
3.分 辨 率：0.1nT
4.允许梯度：≤8,000 nT/m
5.基站测量间隔：6～60秒，可设定
6.测量速度：4 秒/读数
7.GPS定位精度： < 2.5m
8.工作温度：-10℃～+50℃
9.液晶显示：240×240图形液晶，带背光
10.通讯接口：USB
11.内存：64 MB
12.电 源： DC14.4V 5200mA内置可充电锂电池可待机连续工作20小时
13.主机：外形尺寸：270mm×110mm×223mm 重 量：2.5Kg
14.探头：外形尺寸：Φ74×150mm 重量：0.8Kg

五、仪器组成及使用说明

ACZ-8 智能质子磁力仪由主机一台，探头、测量电缆、充电器各一个，探杆 4 节，背带一付等组成.主机面板右侧上部为显示器辉度调节旋扭，中部为专用 充电插孔，下部为仪器开机/充电开关；中间为仪器 16 键输入操作键盘；左侧为 大屏幕液晶显示器；主机右侧上部为连接探头的三芯航空插座，下部为测量数据 导出的专业U盘接口（USB接口）。

主机右侧上部插座是与探头电缆连接。探头用一级防磁材料制成，全密封， 有三芯航空插座用于连接电缆（如图1所示）。连接安装时与电缆连接插头对接 就可使用。测量时探头有方向性，探头轴线方向为南北向。由于主机电池原因仪 器主体不能全部消磁，所以工作时主机应尽量离探头远一些以保证测量精度。如 两人操作时持探头人员应去掉身上所有的铁磁物体，如手表、手机、钢笔、小刀 等。在实际测量工作之前可以用仪器测量读数，在远离探头读数若两次读数一样 则认为铁磁干扰已清除。在工作完成后为保证第二天的工作质量在有条件的地方应对仪器充电，当充电器绿灯亮时则说明仪器充电充满完成。

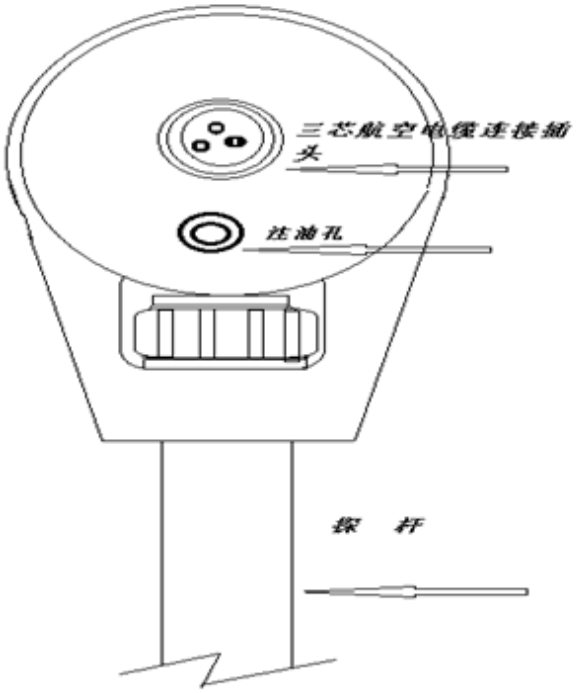

图 1 探头

六、仪器操作方法介绍

1、系统简介

ACZ-8 智能质子磁力仪分为野外仪器操作和计算机数据处理两部分，野外仪 器用于野外实地探测的数据采集工作;计算机数据处理用于读取野外仪器采集的 数据并分析处理得出探测结果。

2、仪器功能操作说明

2.1、仪器功能

该磁力仪主要功能如图2所示：

图2

2.2、按键介绍

本仪器有16个操作键和一个开机/充电为一体的电源开关(如图3所示)。各键的具体作用和用法在下面分项中详细说明。

图 3

2.3、基础功能

打开电源开关，屏幕显示公司标示的开机画面（见图 4），然后按确定键即 可进入《系统主菜单》 界面。旋转“辉度”旋扭可随意调节主机显示屏的亮度 来满足你的视觉要求。仪器只有处于关机状态才能进行充电工作。(注意：必须 使用本机配备充电器充电，充电电压 AC100-240V，确保仪器及人员生命安全严 禁使用非本机配套充电器充电）

图4（开机画面）

2.4、系统主菜单

本界面共有七项选择菜单（见图 5），通过选择“←”、“→”键来移动 光标行选择相关的任务菜单按“确定”键进入相应的任务界面。界面上方左边显示的是当前北京时间可随时用主机内置 GPS 更新当前时间。右边 Bat 是显示当前 的仪器的电量。

图5（主菜单）

系统主菜单介绍：

》 新建文件：建立文件以保持测量参数及数据（数字输入）；

》 补测文件：对已建立好的文件继续测量；

》 查看文件：对已测的文件数据进行查看；

》 传输文件：把仪器已测量好并存储好的数据导入U盘；

》 清除数据：删除仪器已测量好的数据、曲线及参数等；

》 设置日期：设置仪器时钟方便后期数据整理；

》 设置参数：相对测量时根据测量要求建立测量参数。

2.5、设置参数

设置参数是指在当前工作区野外作业是要根据测区的实际情况建立个个本 测区的测量参数，通过左右箭头移动到“设置参数”菜单上(如图5)这是按“确定”键则进入(图6)，本界面提供用户查看及设定跟仪器和测量有关的参数共 10个。在本界面中按 “测量” 键来移动参数项的上下，每次移动一行参数项； 在每行参数项上按“←”、“→”来移动到要设置参数的数位上直接按数字键“0～ 9”来修改参数，直到所有的参数设置完成后按“确定”键来最后确认并返回《主 菜单》输入错误的参数时(如超出限制范围)不会改变原参数值(即修改无效)。 各参数项的具体含义及操作方法下面分页逐一介绍。

图 6

2.5.1）仪器号：用于区别其它同样仪器，数字输入。

2.5.2）测区号：测区编号或名称，输入要求同5.1项。

2.5.3）操作员：操作仪器的人的编号或代号，输入要求同5.1项。

2.5.4）方 向：所布测线的方向，单位为度，以正北为0度顺时针方向计算，如正东为90度依次类推，输入范围0～360度。

2.5.5）线 距：测线与测线之间的距离，单位为米，输入范围0～9999米。

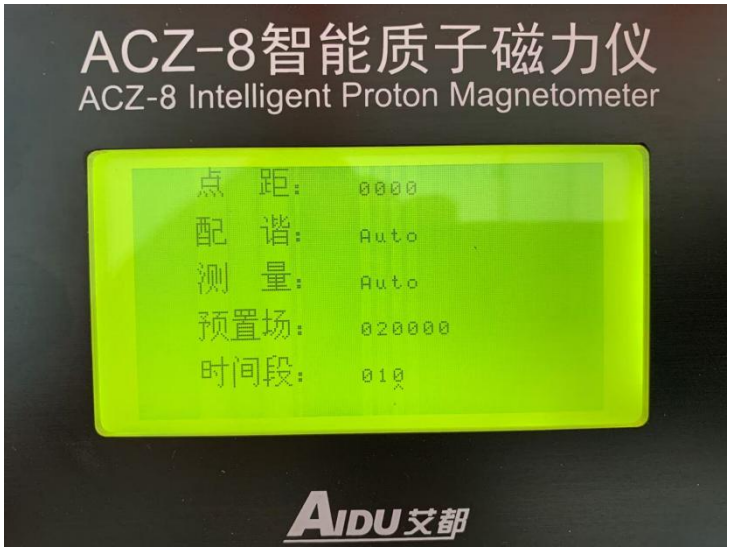

图7

2.5.6)点　距:在一条测线上所布测点之间的距离,单位为米输入范围0～9999米。

2.5.7)配　谐:有两种方式供选择,分别是“Auto”(自动)和 “Look”(锁定)。可通过按“0”键在“Auto”和“Look”之间切换。

》 “Auto”也就是在自动方式下仪器在测量过程中会根据当前测得的场 值,内部自动跟踪调谐。在地磁总场变化不大时只需多读几次数便能够 保证读数的准确性。

》 “Look”也就是在锁定方式下仪器内部根据(5.9 项预置场值)得参数 值固定调谐,它不随测得的总场值变化来调谐。“Look”方式主要用于 地磁梯度变化大的情况下,通过手动配谐(逐渐改变预置场值)以获取重 复性好的读数。

2.5.8)测 量(图.6-2):有两种方式供选择,分别为“Auto”(日变)和“Manual”(单点)。可通过按“0”数字键在“Auto”和“Manual”之间切 换。

》 “Auto”方式通常用于定点的日变观测。该方式下依据(5.10时间段项)参数所设置的时间,启动后自动连续读数无须人工干扰。

》 “Manual”方式用于测区跑点测量。该方式下每测一个点均需操作人员确认(正常读数可以存贮,异常读数重测或加标识后存贮)。

2.5.9)预置场:根据不同地域的地磁总场变化,初始设置一场值为仪器内部调谐用,单位为 nT,输入范围 0～999999nT。比如:上海地区初始设为 48000nT 在 5.7 项配谐设为“Auto”时,会根据当前测得的场值实时修正内部配谐。而 “Look”方式下则保持不变。

2.5.10)时间段:用于在“5.8测量”为“Auto”时,控制仪器隔多少时间

读一次数，“Manual”方式下无意义。单位为秒，输入范围0-999秒。

2.6、设置日期

在主菜单界面通过“←”、“→”键来移动到《设置日期》选项菜单上按“确 定”键进入界面（如图8）。仪器有两种时间设置模式分别为“手动输入”和“自 动更新（GPS）”这两种。

图8

“手动输入”是按“←”、“→”键把光标移动到菜单上按“确定”键进入 根据提示输入当前的年、月、日、时即可（如图9所示）。修改完成后在按“确 定”键确认并返回主菜单就完成了日期的修改。

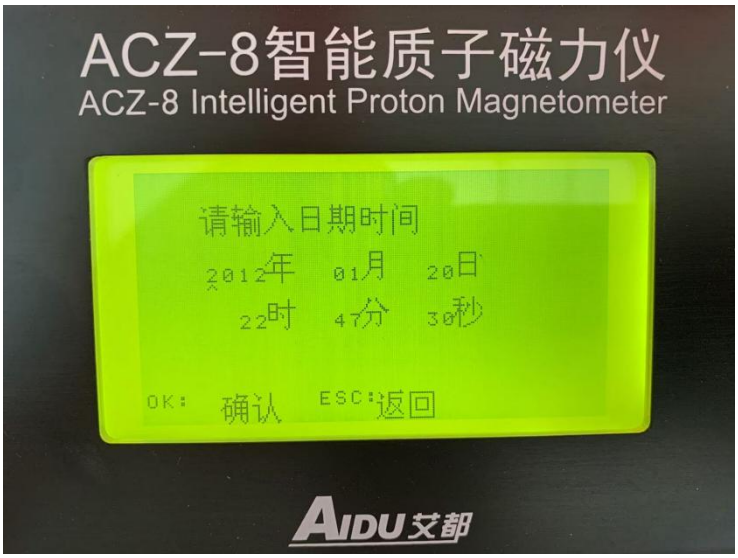

图9

“自动更新（GPS）”：本仪器内部安装有GPS模块无需人工修改按“←”、

“→”键把光标移动到菜单上按“确定” 键就可自动和外部时间同步更新完成修改。

2.7、新建文件

移动“←”、“→”使光标到“新建文件”处，按“确定”键进入新建文件 界面。新建文件界面有两种模式分别为“日变”和“单点”，根据实际测量要求 由《设置参数》中的“5.8测量项”来调整测量模式。

2.7.1、日变:“日变”方式通常用于定点的日变观测，假定用户在“设置参 数”菜单界面中“测量”项设定为“Auto”日变时“新建文件”界面（图10）

图10

A.测量模式： “日变”是表示当前仪器所工作测量的模式状态，（000）是 表示日变模式中仪器自动采集数据的间隔时间，在“设置参数”菜单中的“时间 段”来修改。比如为[日变（010）]时表示在日变模式下每间隔10秒仪器自动采 集一次数据。

B.请输入文件名：输入文件名只能是“000-007”。

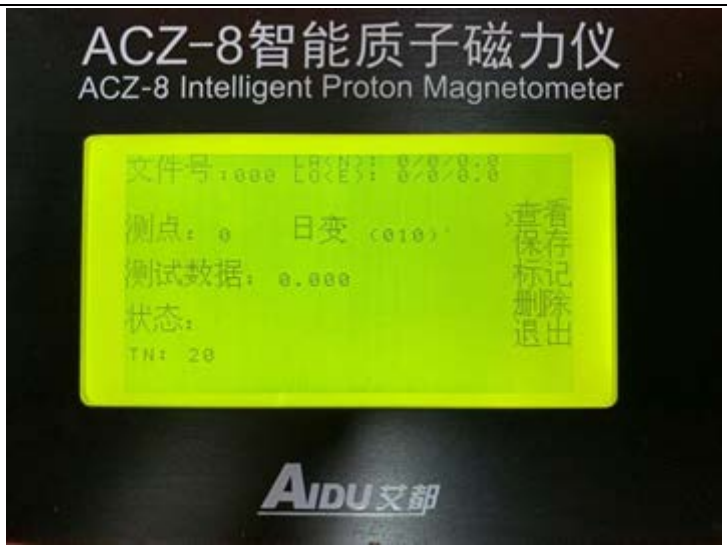

图11

C.进入图11后按键盘中的“测量”键进入日变模式的数据采集状态如图12所示：

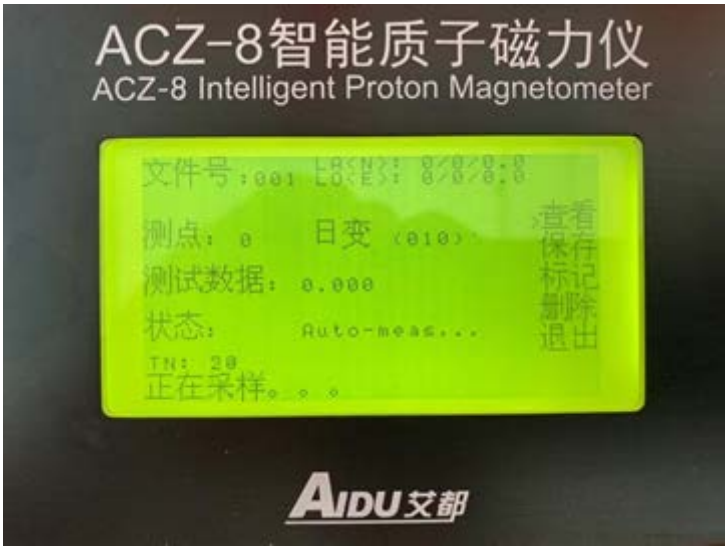

图12

D.下面就各处显示内容加以说明：

》 测点：该位置处显示的是所采集数据的次数，在“自动”方式下从1开始编号，每读完一个数就自动加一，用户不可修改。

》 测试数据：该处显示的是测得的总场值。

》 状态：Auto-meas表示仪器在当前是自动测量工作模式。

》 查看：该选项是查看在这个测点自动采集的所有数据，要查看必须结束 自动测量让仪器处于待测状态。按键盘的“测量”键即可停止测量。在 仪器待测状态下按“←”、“→”使光标“ > ”移动到查看上按“确定” 键进入查看界面如图13所示：

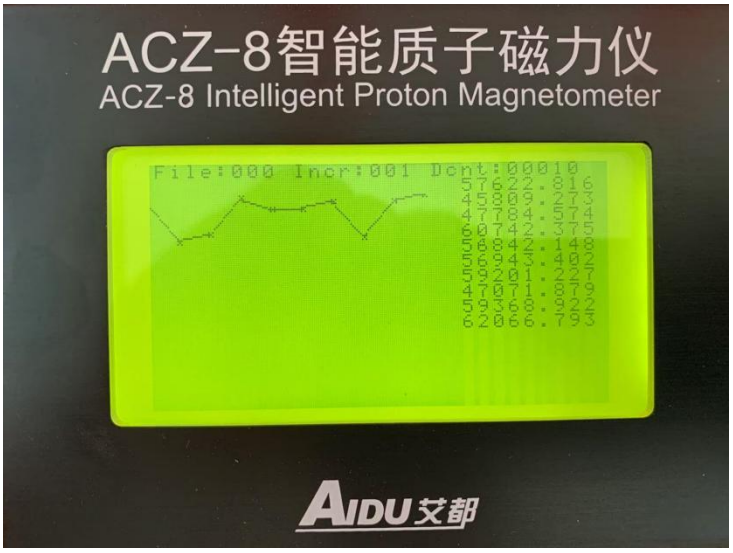

图13

a) File:表示文件号也可表示测点编号；

b) Inor:表示测点增量；

c) Dont:表示该测点共采集的多少组数据；

d) 总场值：该处显示的是本次测得数据的时间；

e) 图形区：“日变”模式时按场值得强度变化实时画出场值得数据 曲线；“单点”模式时按设定的坐标实时画出场值数据曲线。

E、保存：在“日变”模式中保存不需要用户保存，仪器自动存储数据。

F、标记：此处用户可对所测的数据进行自定义。

G、 删除：对相应测线的单个数据进行删除操作，每按一次确定键删除一个 测点。

H、退出：光标移动到退出选项上时按“确定”键即返回主菜单。2.7.2）单点：该功能用于测区跑点测量。下面来介绍“单点”方式中所有可用 的键盘操作和界面显示内容的含义。我们同样假设用户在“设置参数”菜单界面中“测量”项设定为“Manual”单点测量时“新建文件”界面如图14所示：（注：在以下内容中与“日变”模式中显示相同部分不再介绍。）

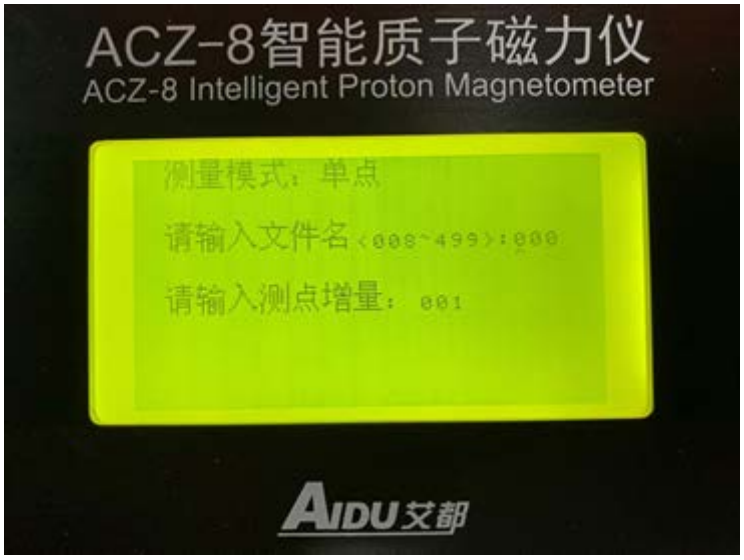

图14

A．测量模式：我们可以在界面中看到测量模式项中“单点”即表示当前的 仪器为单点工作测量模式。

B．请输入文件名：在此模式下，输入测点增量只能是“008-499”。 输入设置完成后按“确认”键提示正在创建文件，后则自动转到下一界面如图15所示：

图15

进入图 15 的待测界面后按键盘“测量”进行采样测量。“单点”和“日变”两种模式在此界面中的只有“保存”和“测量”不同外，其它功能操作请参考“日变”模式。

在“单点”模式中按键盘“测量”键则开始进行测量，测量结束后，把光 标移动到“保存”选项上，按键盘“确定”键保存，仪器不会自动保存数

据（注　意：所测量的数据一定要按“保存”键保存数据）依次进行“测量—保存—确　定”直至完成测量；测量完成后按“菜单”键返回到主菜单。

2.8、补测文件

补测文件是指对已有的某个文件进行进一步扩充的测量或补充的测量，在主菜单中按“←”、“→”键移动光标到“补测文件”选项如图16，在按“确定”　则进入下一步如图17，输入需要补测数据的文件号，如：001。

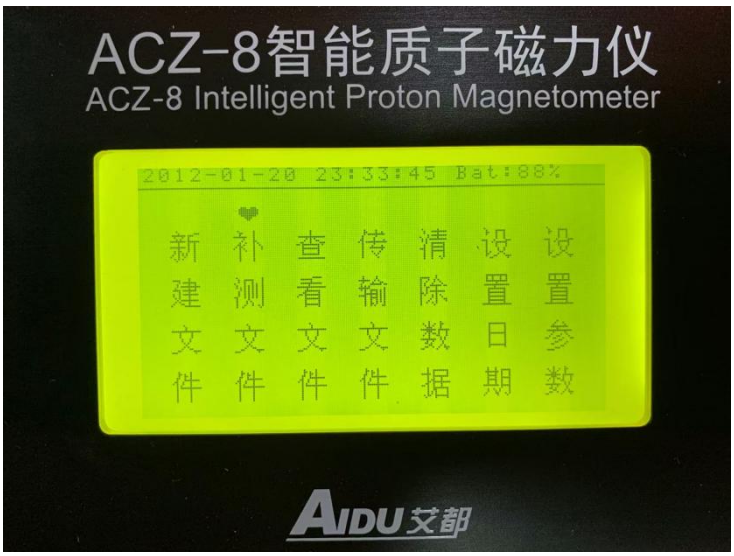

图16

图 17

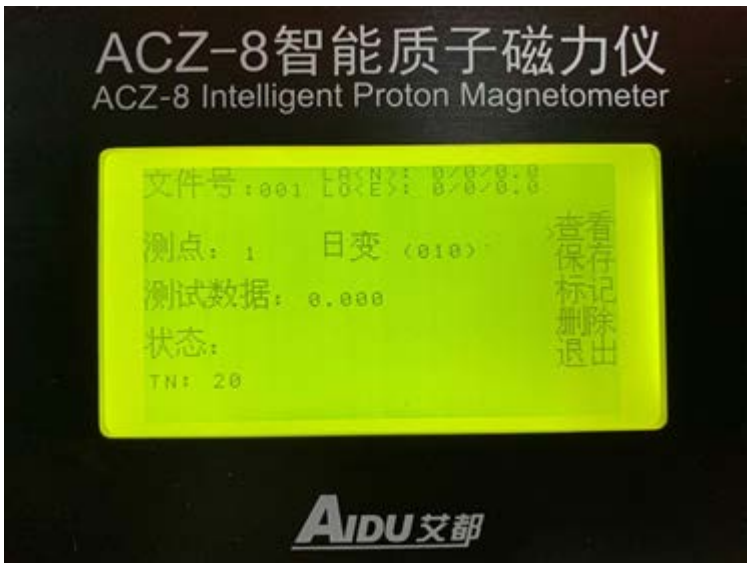

图 18

按“确认”键则进入图18就可以连接之前已经建立好的文件直接测量了。否则在按“菜单”键返回主菜单。

2.9、查看文件

查看是指把所采集的数据文件通过显示屏按曲线形式显示出来。在主菜单按“←”、“→”移动光标“>>”选择“查看文件”按“确定”键进入查看文件界 面如图 19 所示如下：

图 19

图20

选择进入“查看文件目录”按“确定”进入就可以查看仪器内部所存储所有 文件的文件号可按“←”、“→”键移动光标“>>”选择所要的文件号后根据显示 屏下方的提示（OK:查看、1：传输、2：删除、Menu:返回)(图20）通过按数字 键盘直接进入查看、传输、删除、返回等操作。

选择“查看单个文件数据”按“确定”直接输入要查看的文件名，“确定”后直接显示本文件名内所有数据及曲线。 选择“返回”将返回到仪器主菜单。

2.10、传输文件

传输文件是指将测量好的数据文件有选择或者把所有文件全部导出到 U 盘。通过左右箭头键移动到“传输文件”菜单按“确定”键进入传输选项（如图21），通过左右箭头键选择传输所有日变文件、传输所有单点文件和传输单个文件

图21

用数据线连接 U 盘和仪器左侧的六孔插座，选择“传输所有文件”可以把仪 器内部所有的数据都传输到U盘，选择“传输单个文件”后输入所需要传输的文 件名则直接传输该文件的数据。

传输文件后，仪器自动在U盘内部形成一个AIDU.DAT的文件名，可在PC机上使用Excel、Surfer、记事本等软件打开，重复的文件名在文件上不覆盖而是 在列表后面显示。选择“返回”将返回到仪器主菜单。

2.11、清除数据

通过左右箭头按键移动光标到“清除数据”项按“确定”键进入下一步菜单(如图22 所示)，通过左右箭头选择“清除所有文件”或“清除单个文件”。清除所有文件：删除仪器内所有的文件。 清除单个文件：选择删除单个文件后，输入需要删除的文件号，按“确定”，键系统会直接清除你所选的文件（如图23）

图22

图23

七、操作注意及检查

1、仪器使用前、后均应查看其内部电量多少，若电量不能满足当前测量所需 应及时对仪器充电。充电方法是：将仪器配套使用的充电器的连接插头插入仪器 面板标有“充电”的插孔中，而后将充电器自身2芯插头插入220V/50Hz的交流 电源插座上，此时充电器的指示灯应为红色，说明充电器在对仪器充电。当充电 器指示灯变为绿色则说明仪器电量以饱和充电已结束。当仪器在使用工程中仪器 电量显示低于50%时，应在做完当前必须要完成的测量工作后更换备用电池及时 对仪器充电。

2、仪器长时间存放时内部时钟将停止工作，日期和时间值丢失。仪器应至少每3个月充电一次，充电时间12小时以保证电池寿命。重新使用时应先设置时 间

参数。

3、在仪器使用前、后均应对探头进行例行检查，查看其是否漏油、探头电缆 与探头3芯插件连接是否良好、有无断路或短路现象。若存在上述问题请及时与 厂方联系并在厂方的指导下解决。

探头轴向方向正对地磁南北极方向位置为最佳，此方向放置可获得高质量的旋进信号。另外探头探杆由4节组合而成。对于地表干扰较大或磁异常较大的测 量点可组成2米长的探杆进行地磁测量。一般情况下采用1.5米长的探杆用于地 磁测量。探头在使用过程中应尽量避免磕碰以防漏油和内部短路、断路等发生。

4、野外测量

a、仪器用作日变观测时，建议采用2米长的探杆连接探头。主机离探头尽可能远。探头和主机应安置在僻静、无行人走动或车辆经过的地方，并避免暴晒。

b、仪器用作跑点测量时,即可两人配合(一人操作主机,另一人手持探杆)；也可单人使用背包背带，左手握紧探杆，右手操作键盘的方式完成。（注：每天开始作业前，测点仪器与日变观测仪器对时。）

c、磁性标本参数测定：本仪器可用于测定磁性标本参数工作，具体测定方 法可参考原地矿部DZ/T 0071-93《地面高精度磁测工作规程》附录C-用微机质 子磁力仪测定岩（矿）石标本的方法。

八、应用实例

图24为我公司ACZ-8型智能型质子磁力仪在内蒙古某铁矿做剖面测量所绘的剖 面曲线图。

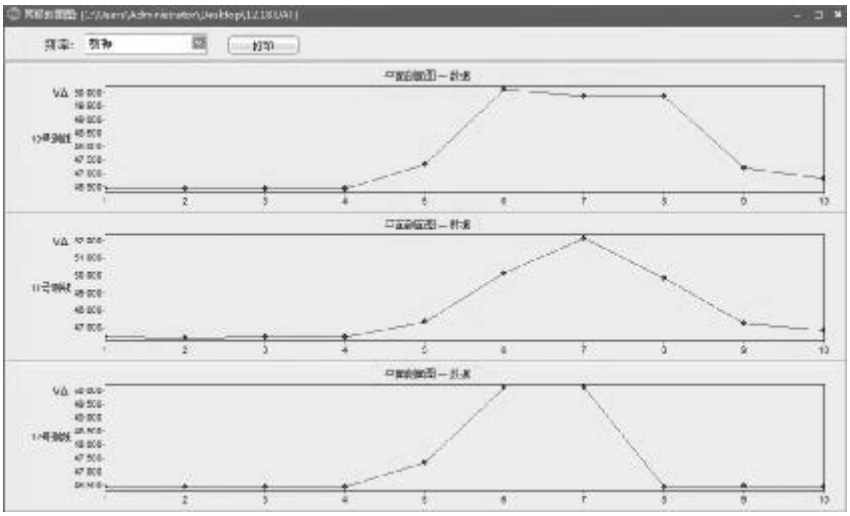

图 24

此次测量一共做了 3 条测线，每条测线上做了 10 个测点，测量面积大概在

4000 ㎡。其中线距 20 米，点距 10 米；测线方向由西向东。由此测量剖面曲线图异常位置较明显均集中在测区的第 5-8 个测点（40-70 米）这段，且由北向南异常区逐渐变小。

图 25 为剖面的异常的等值线图，图形如下：

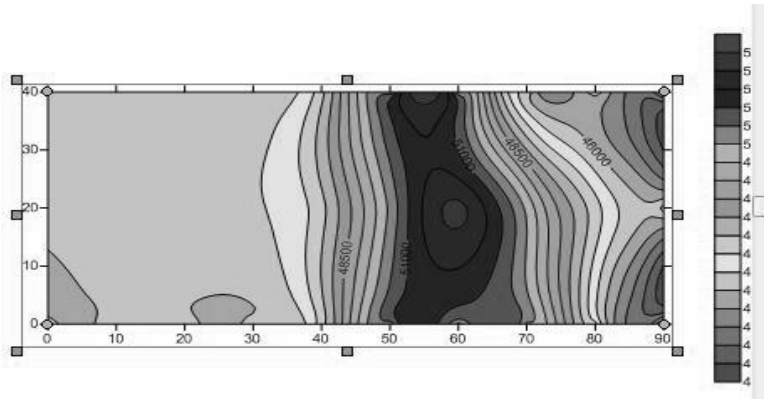

图 25

从等值线图和曲线图可以看出该铁矿在测区的范围、走向、面积等信息，而且两者都基本吻合。从后续开采情况来看误差也就 1-5 米的位置误差。

1. Overview of Instrument Principles

Proton magnetometer belongs to a high-precision branch among many magnetometers. It can achieve high resolution and accuracy even for measuring weaker magnetic objects, such as the Earth's magnetic field, so it can detect even weak changes in the Earth's magnetic field. Its working principle is to use the precession phenomenon of hydrogen protons in a magnetic field for measurement. In the sensor, it is filled with a liquid containing hydrogen, and these hydrogen protons are in an irregular arrangement before being forcibly polarized by the instrument. When a polarization signal is artificially applied to it, the proton will undergo precession motion. After the polarization signal disappears, the proton precession will be mainly affected by the external magnetic field and gradually disappear. The magnitude of the external magnetic field can be measured by measuring the frequency in the signal transmitter affected by precession. Continuously cycling through this action allows for continuous measurement.

The ACZ-8 proton magnetometer has a magnetic field measurement accuracy of ± 1nT and a resolution of up to 0.1nT, fully meeting the requirements of the "Ground High Precision Magnetic Survey Work Regulations" issued by the local mining department.

2. Main characteristics of the instrument

》Large storage capacity, high resolution, and flexibility can be used for field operations and also for base station measurements.

》It can be automatically tuned across the entire range or manually tuned.

》Built in precision clock and GPS timing ensure accurate synchronization of clocks between base stations and various mobile measurement stations.

》Each measurement point stores information such as magnetic field measurement results, measurement point coordinates, and time,

》Export all data directly from the USB drive.

》Equipped with software for daily variation correction, capable of drawing contour maps, profiles, etc.

》The fully Chinese interface automatically displays the magnetic field strength curve, making the operation simpler and more convenient, and one person can complete all measurement tasks.

3. Application scope

》Mineral exploration, such as iron ore, lead-zinc ore, copper ore, etc

》Cooperate with mining area exploration, study the burial depth, occurrence, and continuity of the ore body, investigate the shape and size of the ore body, and estimate the scale of the ore deposit

》Exploration of petroleum and natural gas, research on geological structures and geological structures related to oil and gas

》Census, detailed investigation, geological mapping

》Ground diurnal variation stations for aviation and marine magnetic surveys

》Fault location

》Archaeology

》Hydrology

》Engineering survey, such as pipeline detection, etc

》Earthquake precursor monitoring, volcano observation, and other environmental and disaster geological work

》Detection of small ferromagnetic objects, etc

4. Main technical parameters of the instrument

1. Measurement range: 20000 nT to 100000 nT
2. Measurement accuracy: ± 1nT
3. Resolution: 0.1nT
4. Allowable gradient: ≤ 8000 nT/m
5. Base station measurement interval: 6-60 seconds, adjustable
6. Measurement speed: 4 seconds per reading
7. GPS positioning accuracy:<2.5m
8. Working temperature: -10 ℃ to+50 ℃
9. LCD display: 240 × 240 graphic LCD with backlight
10. Communication interface: USB
11. Memory: 64 MB
12. Power supply: DC14.4V 5200mA, built-in rechargeable lithium battery can work continuously for 20 hours in standby mode
13. Host: Dimensions: 270mm × 110mm × 223mm Weight: 2.5Kg
14. Probe: Dimensions: Ø 74 × 150mm Weight: 0.8Kg

5. Instrument composition and usage instructions

The ACZ-8 intelligent proton magnetometer consists of one main unit, one probe, one measuring cable, one charger, four probe rods, and one strap. The upper right side of the main unit panel is the display brightness adjustment knob, the middle is the dedicated charging socket, and the lower part is the instrument power on/charging switch; The middle is the instrument 16 key input operation keyboard; On the left is a large screen LCD display; The upper right part of the host is a three core aviation socket for connecting probes, and the lower part is a professional USB interface for exporting measurement data.

The upper socket on the right side of the host is connected to the probe cable. The probe is made of first-class anti magnetic material, fully sealed, and has a three core aviation socket for connecting cables (as shown in Figure 1). When connecting and installing, it can be used by docking it with the cable connector plug. The probe has directionality during measurement, and the axis direction of the probe is north-south. Due to the limitations of the host battery, the instrument body cannot be completely demagnetized. Therefore, during operation, the host should be kept as far away from the probe as possible to ensure measurement accuracy. When two people are operating, the person holding the probe should remove all ferromagnetic objects from their body, such as watches, mobile phones, pens, knives, etc. Before actual measurement work, instrument readings can be taken. If two readings are the same while away from the probe, it is considered that ferromagnetic interference has been cleared. After completing the work, in

order to ensure the quality of the next day's work, the instrument should be charged in a place where conditions permit. When the green light of the charger is on, it indicates that the instrument is fully charged.

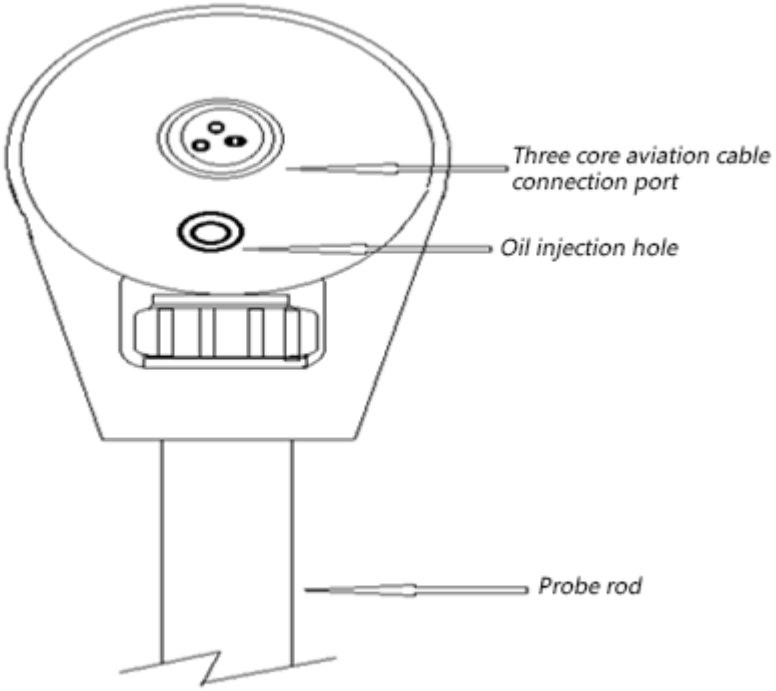

Figure 1

6. Introduction to Instrument Operation Methods

1. System Introduction

The ACZ-8 intelligent proton magnetometer is divided into two parts: field instrument operation and computer data processing. The field instrument is used for data acquisition in field exploration; Computer data processing is used to read data collected by field instruments and analyze and process it to obtain detection results.

2. Instrument Function Operation Instructions

2.1 Instrument functions

The main functions of this magnetometer are shown in Figure 2:

Figure 2

2.2 Button Introduction

This instrument has 16 operation keys and a power switch that integrates power on/charging (as shown in Figure 3).

The specific functions and usage of each key are explained in detail in the following sub items.

Figure 3

2.3 Basic functions

Turn on the power switch, the screen will display the startup screen marked by the company (see Figure 4), and then press the OK button to enter the "System Main Menu" interface. Rotate the "brightness" knob to freely adjust the brightness of the host display screen to meet your visual requirements. The instrument can only be charged when it is turned off. (Note: It is necessary to use the charger equipped with this machine for charging, with a charging voltage of AC100-240V, to ensure the safety of the instrument and personnel. It is strictly prohibited to use chargers that are not compatible with this machine for charging.)

Figure 4

2.4. System Main Menu

There are seven selection menus on this interface (see Figure 5). By selecting the "←" and "→" keys, move the cursor line to select the relevant task menu. Press the "OK" key to enter the corresponding task interface. The left side above the interface displays the current Beijing time, which can be updated at any time using the built-in GPS of the host. Bat on the right displays the current battery level of the instrument.

Figure 5

Introduction to the main menu of the system:

》New file: Create a file to maintain measurement parameters and data (digital input);

》Supplementary measurement files: Continue measuring the established files;

》View Files: View the data of the tested files;

》Transfer files: Import the measured and stored data of the instrument into a USB drive;

》Clear data: delete the measured data, curves, parameters, etc. of the instrument;

》Set date: Set the instrument clock for easy data organization in the later stage;

》Set parameters: Establish measurement parameters based on measurement requirements during relative measurement.

2.5. Setting Parameters

Setting parameters refers to establishing measurement parameters for each measurement area based on the actual situation of the measurement area during field operations in the current workspace. By moving to the "Setting Parameters" menu with the left and right arrows (as shown in Figure 5), pressing the "OK" button will enter (Figure 6). This interface provides users with a total of 10 parameters related to instruments and measurements for viewing and setting. Press the "Measure" button in this interface to move the parameter items up and down, moving one line of parameter items at a time; Press "←" and "→" on each parameter item to move to the digit where the parameter needs to be set. Press the number keys "0-9" directly to modify the parameter until all parameter settings are completed. Press the "OK" key to confirm and return to the "Main Menu". When inputting incorrect parameters (such as exceeding the limit range), the original parameter values will not be changed (i.e. the modification is invalid). The specific meanings and operation methods of each parameter item are introduced in the following pages one by one.

Figure 6

2.5.1) Instrument number: Used to distinguish other similar instruments, numerical input.

2.5.2) Area code: Area code or name, input requirements are the same as in item 5.1.

2.5.3) Operator: The number or code of the person operating the instrument, with the same input requirements as in section 5.1.

2.5.4) Direction: The direction of the survey line, in degrees, measured clockwise with 0 degrees due north

Calculate, such as 90 degrees due east, and so on, with an input range of 0 to 360 degrees.

2.5.5) Line distance: The distance between measuring lines, measured in meters, with an input range of 0 to 9999 meters.

Figure7

2.5.6) Point distance: The distance between measuring points arranged on a measuring line, measured in meters, with an input range of 0 to
9999 meters.

2.5.7) Coordination: There are two ways to choose from, namely "Auto" and "Look"
Ding). You can switch between "Auto" and "Look" by pressing the "0" key.

》Auto "means that in automatic mode, the instrument will automatically track and tune internally based on the current measured field value during the measurement process. When the total geomagnetic field changes little, only a few more readings are needed to ensure the accuracy of the readings.

》Look "refers to the fixed tuning of the instrument's internal parameters based on (5.9 preset field values) in the locked mode, and it does not tune with changes in the measured total field value. The "Look" method is mainly used in situations where the geomagnetic gradient changes significantly, by manually adjusting the preset field values (gradually changing them) to obtain readings with good repeatability.

2.5.8) Measurement (Figure 6-2): There are two methods to choose from, namely "Auto" (daily variation) and "Manual" (single point). You can switch between "Auto" and "Manual" by pressing the "0" numeric key.

》The "Auto" mode is usually used for fixed-point daily observation. Under this method, based on (5.10 time period item)
The time set by the parameter will automatically read continuously after startup without manual interference.

》The "Manual" method is used for measuring running points in the measurement area. Under this method, an operator is required to measure each point
Confirm (normal readings can be stored, abnormal readings can be retested or marked and stored).

2.5.9) Preset Field: Based on the changes in the total geomagnetic field in different regions, an initial field value is set for internal tuning of the instrument, with a unit of nT and an input range

of 0-999999 nT. For example, in the Shanghai area, when the initial setting is 48000nT and the 5.7 harmonic setting is set to "Auto", the internal harmonic setting will be adjusted in real-time based on the current measured field values. In the 'Look' mode, it remains unchanged.

2.5.10) Time period: Used to control how many times the instrument reads when "5.8 measurement" is set to "Auto", and it is meaningless in "Manual" mode. The unit is seconds, with an input range of 0-999 seconds.

2.6. Set Date

On the main menu interface, use the "←" and "→" keys to move to the "Set Date" option menu and press the "OK" key to enter the interface (as shown in Figure 8). The instrument has two time setting modes, namely "manual input" and "automatic update (GPS)".

Figure 8

Manual input "is to press the" ← "and" → "keys to move the cursor to the menu and press the" OK "key to enter the current year, month, day, and hour according to the prompts (as shown in Figure 9). After the modification is completed, press the "OK" button to confirm and return to the main menu to complete the date modification.

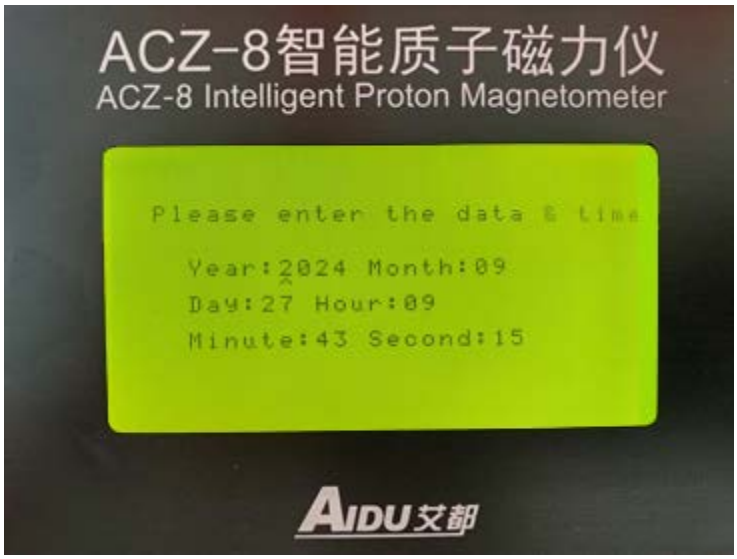

Figure 9

Automatic Update (GPS): This instrument is equipped with a GPS module that does not require manual modification. Press the "←" and "→" keys to move the cursor to the menu and press the "OK" key to automatically synchronize with the external time to complete the modification.

2.7. New File

Move the cursor to the "New File" position with "←" and "→", and press the "OK" key to enter the new file interface. There are two modes for creating a new file interface, namely "daily variation" and "single point". The measurement mode can be adjusted according to the actual measurement requirements using the "5.8 Measurement Item" in the "Setting Parameters".

2.7.1 Daily variation: The "daily variation" method is usually used for fixed-point daily variation observation. Assuming that the user sets the "Measurement" item to "Auto" in the "Parameter Settings" menu interface, when the "New File" interface is used for daily variation (Figure 10)

Figure 10

A. Measurement mode: "Daily variation" represents the current measurement mode status of the instrument, (000) represents the interval time for the instrument to automatically collect data in daily variation mode, which can be modified in the "Time Period" of the "Settings Parameters" menu. For example, when it is [daily variation (010)], it means that the instrument automatically collects data every 10 seconds in daily variation mode.

B. Please enter file name: The input file name can only be '000-007'.

Figure 11

C. After entering Figure 11, press the "Measure" button on the keyboard to enter the data collection state of the daily variation mode, as shown in Figure 12:

Figure 12

D. Below are explanations of the displayed content in each location:

》 □Measurement point: The number of times the data was collected is displayed at this location, starting from 1 in "automatic" mode

The initial number is automatically incremented every time a number is read and cannot be modified by the user.

》 Test data: This displays the total field value measured.

》 Status: Auto meas indicates that the instrument is currently in automatic measurement mode.

》 □View: This option is to view all the data automatically collected at this measurement point. To view, the automatic measurement must be ended and the instrument must be in the test state. Press the "Measure" button on the keyboard to stop the measurement. Press "←" and "→" while

the instrument is under test to move the cursor ">" to the viewing area. Press the "OK" button to enter the viewing interface as shown in Figure 13:

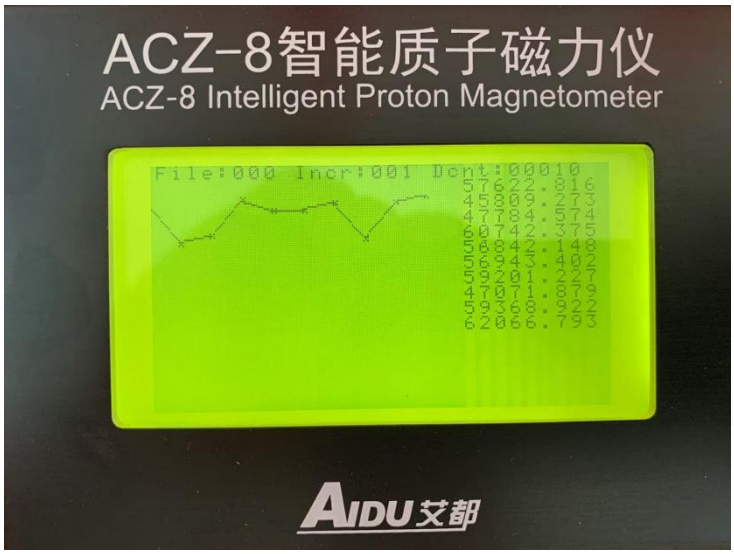

Figure 13

a) File: represents the file number or the measurement point number; b) Inor: represents the increment of measurement points;

c) Don: Indicates how many sets of data were collected at the measurement point in total;

d) Total field value: This displays the time of the data obtained in this measurement;

e) Graph area: In the "daily variation" mode, real-time plot of field value data curves based on changes in field value intensity; In the "single point" mode, real-time plot the field value data curve according to the set coordinates.

E、 Save: In the "Daily Change" mode, saving does not require user saving, and the instrument automatically stores data.

F、 Tag: Users can customize the measured data here.

G、 Delete: Perform a deletion operation on individual data of the corresponding survey line, deleting one survey point every time you press the OK key.

H、 Exit: When the cursor moves to the exit option, press the "OK" key to return to the main menu. 2.7.2) Single point: This function is used for measuring running points in the measurement area. Next, we will introduce the meanings of all available keyboard operations and interface display content in the "single point" mode. We also assume that when the user sets the "Measurement" item to "Manual" in the "Parameter Settings" menu interface for single point measurement, the "New File" interface is shown in Figure 14:

(Note: The same parts as those displayed in the "daily variation" mode will not be introduced in the following content.)

Figure 14

A. Measurement mode: We can see in the interface that "single point" in the measurement mode item indicates that the current instrument is in single point working measurement mode.
B. Please enter the file name: In this mode, the input measurement point increment can only be "008-499". After completing the input settings, press the "confirm" button to prompt that the file is being created, and then it will automatically go to the next interface
As shown in Figure 15:

Figure 15

After entering the test interface in Figure 15, press the keyboard "Measure" to perform sampling measurement. The only difference between the "single point" and "daily variation" modes on this interface is "save" and "measure". For other functional operations, please refer to the "daily variation" mode.
Press the "Measure" button on the keyboard in "Single Point" mode to start the measurement. After the measurement is completed, move the cursor to the "Save" option and press the "OK"

button on the keyboard to save. The instrument will not automatically save the data (note: the measured data must be saved by pressing the "Save" button). Perform "measurement save confirm" in sequence until the measurement is completed; After the measurement is completed, press the "Menu" button to return to the main menu.

2.8. Supplementary testing documents

Supplementary measurement file refers to further expanding or supplementing an existing file through measurement. Press the "←" and "→" keys in the main menu to move the cursor to the "Supplementary Measurement File" option, as shown in Figure 16. Press' OK 'to proceed to the next step as shown in Figure 18. Enter the file number of the data that needs to be retested, such as 000：

Figure 16

Figure 17

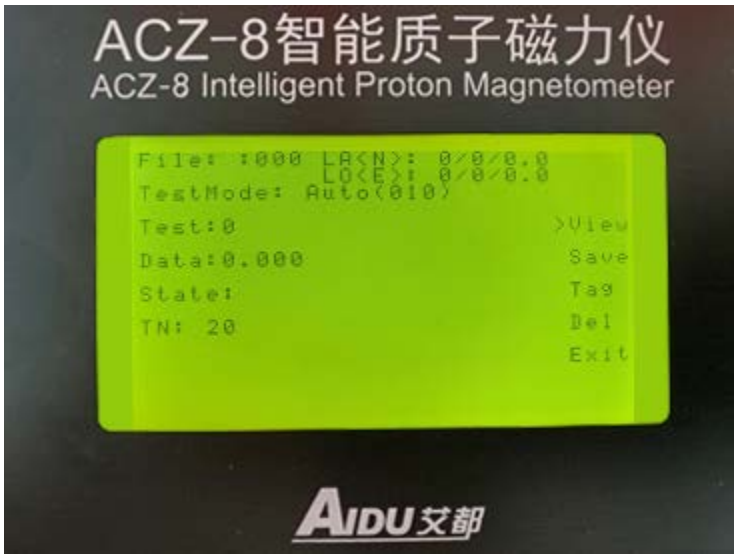

Figure 18

Press the "confirm" button to enter Figure 18 and connect the previously established file for direct measurement. no

Then press the 'Menu' button to return to the main menu.

2.9. Viewing Files

Viewing refers to displaying the collected data files in a curved form on a display screen. Press "←" and "→" in the main menu to move the cursor, select "View File", and press "OK" to enter the file viewing interface as shown in Figure 19：

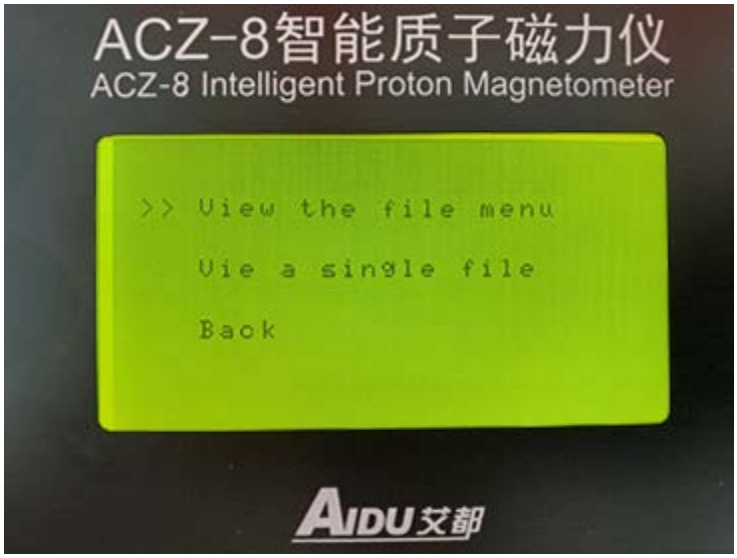

Figure 19

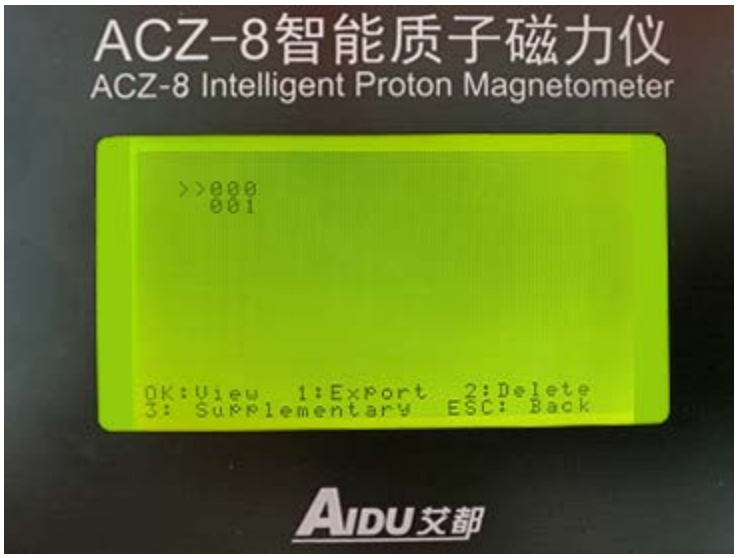

Figure 20

Select "View File Catalog" and press "OK" to view the file numbers of all files stored inside the instrument. Press the "←" and "→" keys to move the cursor ">>" and select the desired file number. Follow the prompts below the display screen (OK: View, 1: Export, 2: Delete, 3: Supplementary ESC: Back) (Figure 20) to directly enter the view, Export, delete, Back and other operations by pressing the numeric keypad.

Select "View Single File Data" and press "OK" to directly enter the file name to be viewed. After "OK", all data and curves within this file name will be displayed directly. Selecting 'Return' will take you back to the main menu of the instrument.

2.10. File Transfer

Transferring files refers to selectively or exporting all measured data files to a USB drive. Use the left and right arrow keys to move to the "Transfer Files" menu and press the "OK" key to enter the transfer options (as shown in Figure 21). Use the left and right arrow keys to select between transferring all diurnal files, transferring all single point files, and transferring a single file.

Figure 21

Connect the USB flash drive and the six hole socket on the left side of the instrument with a data cable. Select "Transfer All Files" to transfer all internal data of the instrument to the USB flash drive. Select "Transfer Single File" and enter the file name to transfer the data directly.
After transferring the file, the instrument automatically forms an AIDU inside the USB drive The file name of DAT can be opened on a PC using software such as Excel, Surfer, Notepad, etc. Duplicate file names are not overwritten on the file but displayed at the end of the list. Selecting 'Return' will take you back to the main menu of the instrument.

2.11. Clear Data

Use the left and right arrow keys to move the cursor to the "Clear Data" option and press the "OK" key to enter the next menu (as shown in Figure 22). Use the left and right arrows to select "Clear All Files" or "Clear Individual Files". Clear all files: Delete all files within the instrument. Clear a single file: After selecting to delete a single file, enter the file number that needs to be deleted, press "OK", and the system will directly clear the selected file (as shown in Figure 23).

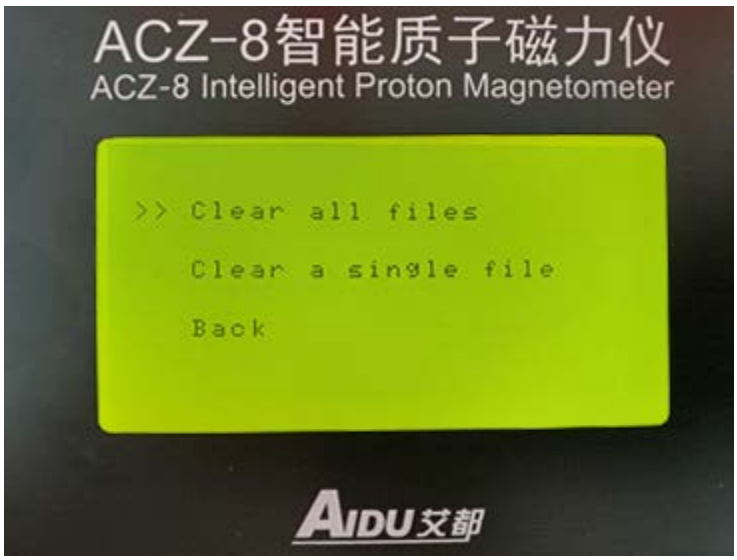

Figure 22

Figure 23

7. Operation attention and inspection

1. Before and after using the instrument, the internal battery level should be checked. If the battery level cannot meet the current measurement requirements, the instrument should be charged in a timely manner. The charging method is to insert the connection plug of the charger used with the instrument into the socket marked "charging" on the instrument panel, and then insert the charger's own 2-core plug into a 220V/50Hz AC power socket. At this time, the indicator light of the charger should be red, indicating that the charger is charging the instrument. When the charger indicator light turns green, it indicates that the instrument's battery level has reached saturation and charging has ended. When the instrument's battery level displays below 50% during use, the backup battery should be replaced and the instrument should be charged in a timely manner after completing the necessary measurement work.

2. When the instrument is stored for a long time, the internal clock will stop working, and the date and time values will be lost. The instrument should be charged at least once every 3 months for 12 hours to ensure battery life. When reusing, the time parameter should be set first.

3. Before and after using the instrument, routine inspections should be conducted on the probe to check for oil leakage, good connection between the probe cable and the probe 3-core plug, and any open or short circuits. If the above problems exist, please contact the factory in a timely manner and solve them under the guidance of the factory.

The optimal position for the probe's axial direction to face the geomagnetic north-south direction is to place it in this direction to obtain high-quality precession signals. In addition, the probe rod is composed of four sections. For measurement points with significant surface interference or magnetic anomalies, a 2-meter long probe can be used to conduct geomagnetic measurements. Generally, a 1.5-meter-long probe is used for geomagnetic measurements. The probe should be avoided from collision as much as possible during use to prevent oil leakage, internal short circuits, open circuits, etc.

4. Field measurement

a、 When the instrument is used for daily variation observation, it is recommended to use a 2-meter-long probe rod to connect the probe. The host is as close to the probe as possible

Can go far. The probe and host should be placed in a secluded area without pedestrians or vehicles passing by, and avoid direct sunlight exposure.

b、 When the instrument is used for running point measurement, two people can cooperate (one person operates the host, and the other person holds the probe);

You can also use the backpack strap alone, grip the probe with your left hand, and operate the keyboard with your right hand to complete the task. (Note: Before starting work every day, the measuring instruments should be synchronized with the daily observation instruments.)

c、 Magnetic specimen parameter determination: This instrument can be used to determine the parameters of magnetic specimens. The specific determination method can refer to Appendix C of DZ/T 0071-93 "Ground High Precision Magnetic Measurement Work Regulations" of the Ministry of Mineral Resources. The method of using a microcomputer proton magnetometer to determine rock (mineral) standards can be used.

8. Application examples

Figure 24 shows the profile curve of our company's ACZ-8 intelligent proton magnetometer used for profile measurement at a certain iron mine in Inner Mongolia.

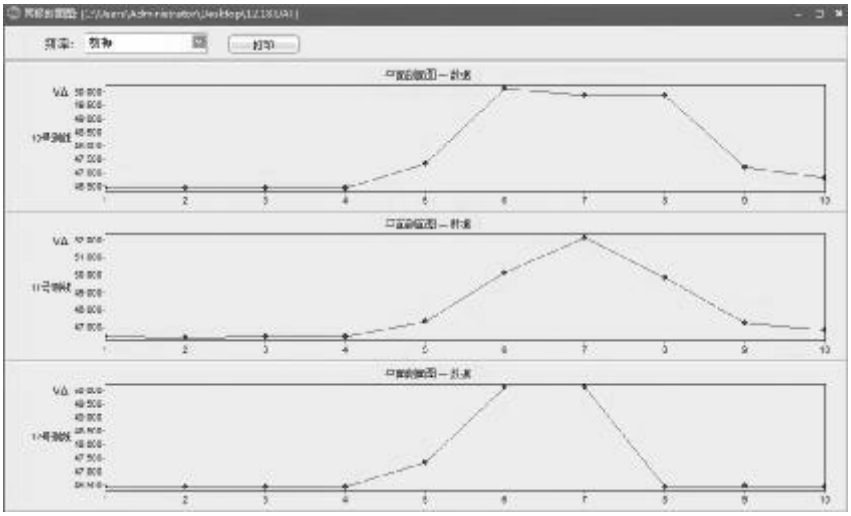

Figure 24

A total of 3 measuring lines were taken for this measurement, with 10 measuring points on each line, covering an area of approximately 4000 square meters. The line spacing is 20 meters and the point spacing is 10 meters; The direction of the survey line is from west to east. As a result, the abnormal positions in the measured profile curve are significantly concentrated in the 5th to 8th measurement points (40-70 meters) of the measurement area, and the abnormal area gradually decreases from north to south.

Figure 25 shows the contour map of the anomaly in the cross-section, as follows:

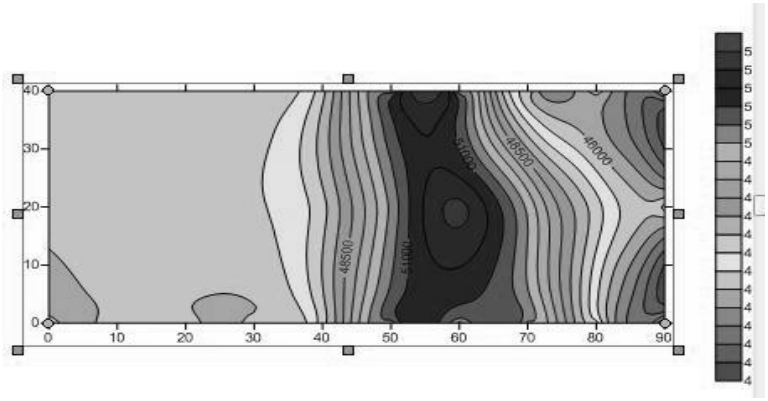

Figure 25

From the contour map and curve map, it can be seen that the range, direction, area and other information of the iron ore in the survey area are basically consistent. From the subsequent mining situation, the error is only a position error of 1-5 meters.

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艾都勘探 铸造典范

上海艾都慧测智能科技有限公司

Shanghai Aidu Intelligent Detection Technology Co. Ltd.

地　　址：上海市闵行区澄建路466号(5号厂房)

邮政编码：201108

销售热线：+86-21-51860763 (6线)

传　　真：+86-21-51862550

售后热线：+86-21-61508053 (3线)